

DESIGNER'S GUIDE FOR THE PANEL PROGRAM

By

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University of Dayton Research Institute

and

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Air Force Aerospace Medical Research Laboratory

JULY 1980

Contract No. F33615-78-C-0507



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Designer's Guide	Controls and Displays									
Panel	Man-Machine System									
Two-dimensional	Computer Aided Design Program									
Design tool	Program Functions and Subfunctions									
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <p>This Designer's Guide describes an interactive computer graphics program intended for the computer aided design of avionics control and display panels. Using this program, a designer can specify the basic panel on which all other components will be mounted as well as the components themselves. Also, he can locate and relocate the components, add graphic elements (text, lines, circles), and call for printed, punched, or hard copy (plot) output. The requirements and</p>										

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considerations of several applicable MIL-STANDARDS have been incorporated into the program to facilitate the design process.

The Guide to the operation of the PANEL program includes descriptions of the processing available for each of the program functions and subfunctions. A listing of the program is also included along with a brief description of most of the subroutines.

PREFACE

This work was performed under USAF Contract F33615-78-C-0507 entitled Biomechanics of Cockpit Evaluation. The government work unit number for this contract is 71840824. The contract monitor and technical advisor is Dr. Joe W. McDaniel of the Workload and Ergonomics Branch of the Air Force Aerospace Medical Research Laboratory. The development of the programs to which this Designer's Guide refers was performed by Mr. Nilss Aume of the Workload and Ergonomics Branch of the Air Force Aerospace Medical Research Laboratory. The UDRI Technical Report number for this guide is UDR-TR-80-64.

The purpose of this report is to provide a guide to the use of the PANEL program. It is not intended to document the theoretical approach taken in developing any of the computer programs. A listing of the program is included in Appendix A, along with a brief description of most of the subroutines.

The authors would like to acknowledge the assistance provided by Dr. Joe W. McDaniel of the Workload and Ergonomics Branch of the Air Force Aerospace Medical Research Laboratory and Mr. Paul Kikta of the University of Dayton Research Institute. In addition, the authors would like to thank Ms. Tracy Duncan and Ms. Charlene Thompson of UDRI for typing and re-typing the various revisions.

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SECTION 1

INTRODUCTION

Some designs require the positioning of large numbers of controls on panels to facilitate the efficient performance of the man-machine system. In some cases the layout is relatively unimportant. However, it becomes important when there are stringent working requirements such as in aircraft cockpits or when complex industrial processes are being controlled.

In designing a new panel arrangement, the designer must consider safety, closeness of controls for ease of use, separation of controls for avoidance of mistakes, and the advantage of functional layout for ease of operator understanding. If the panel is intended for use in a military aircraft, then there is a set of standards and specifications which must be followed. While some of these specifications and standards are not amenable to inclusion in a computer aided design program, certain ones can be included, such as specifications that deal with sizes, distances, and minimum clearances, as these can be expressed in the form of an algorithm.¹

The PANEL program has been developed to aid a work station designer to design, select, and arrange a group of controls and/or displays for avionics and machinery components. The PANEL program is a part of a Human Engineering Computer Aided Design (HECAD) system of programs developed by Mr. Nilss Aume of the Workload and Ergonomics Branch of the Air Force Aerospace Medical Research Laboratory. The PANEL program is an independent program and runs separately from HECAD.

¹The following MIL-SPECS and MIL-STANDARD have been incorporated into the program: MS 25212 (ASG) "Control Panel, Console Type, Aircraft Equipment, Basic Dimensions". MS 25213 (ASG) "Control Panel, Aircraft Equipment, Typical Installation" MIL-C-81774A, Amendment 1, "Control Panel, Aircraft, General Requirements For."

The PANEL program is a two-dimensional computer aided design tool. Using PANEL, the designer has the ability to locate or relocate the controls on the panels. The interactive capability together with the plotting capability allows the designer to consider a variety of control/display configurations in a short period of time.

1.1 THE PANEL PROGRAM

The PANEL program uses an IBM 2250-3 Display Device for the selection, location and/or relocation of avionics components and is compatible with IBM 3250 terminals. The designer at the display device controls the course of execution of the PANEL program. The program is written in FORTRAN IV and uses the IBM Graphic Subroutine Package (GSP). The PANEL program consists of the main program and eight subroutines. A listing of the main program is included in Appendix A. A brief description and a listing of each subroutine is also included.

Functions of the program may be executed by using the Alpha-numeric Keyboard (ANKB), the Light Pen (LP), or the Programmable Function KEY (PFK). Replies given through the ANKB are displayed on the CRT screen and are processed by the program after simultaneously depressing the ALT-CODING key and "5" key.² Replies that require using the light pen are given by depressing the light pen barrel aimed at the desired point on the CRT screen. Figure 1 shows the IBM 2250-3 CRT in use. The CRT has a 12-inch square Display Area, all of which is used in the program. The program is scaled in such a way that all panels and components are generated in full scale. The origin of the coordinate system is in the center of the screen, so that locations from -6.0 to 6.0 are available, both horizontally and vertically.

²In this Guide the simultaneous depression of the "ALT-CODING" and "5" keys will be referred to as the ALT-CODE/5 sequence. IBM refers to this sequence as EOB (End of Block). (IBM System Reference Library, Program Numbers 360-LM-537).

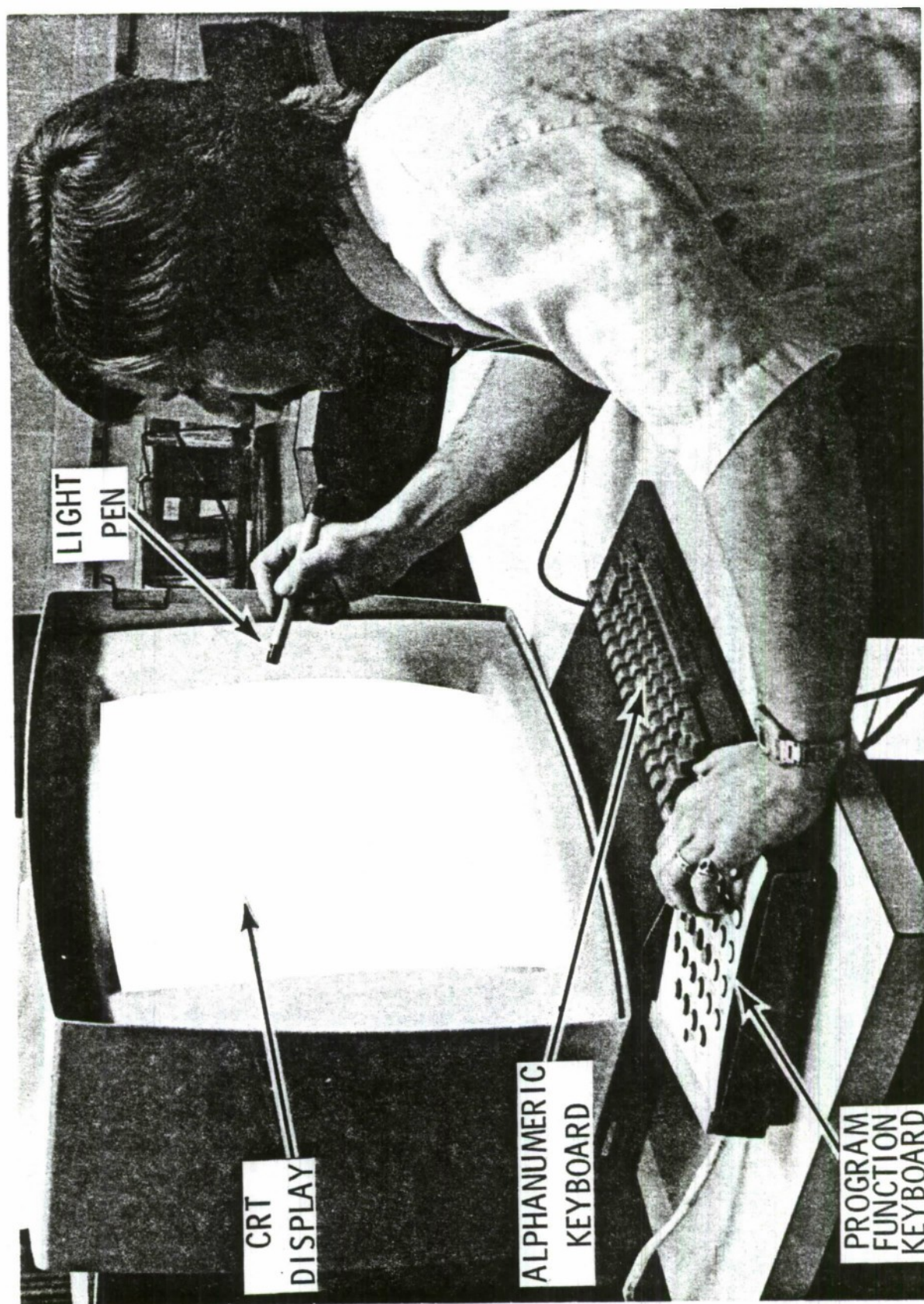


Figure 1. CRT Unit (IBM 2250-3) with Function Keys, Alphanumeric Keyboard and Light Pen.

One of the features in GSP that should be mentioned is the correlation value. It is a value that is assigned by the programmer to be used later in the program to identify one or more elements, sequences, or buffer subroutines within a graphic data set. The programmer provides correlation values by means of the "corr-val" argument. This correlation value is used in the PANEL program, during the program execution, to identify which elements of the picture are light penned. The element may be text or pictorial; or it may be used to either include or omit an element identified with a unique correlation value.

1.2 FUNCTIONS AVAILABLE

The functions which are available to the designer are OUTLINES, COMPONENTS, POSITION, GRAPHICS, HARD COPY, and RECORD. The OUTLINES function enables the designer to generate the outline of the panel. The COMPONENTS function allows the designer to add (input) and/or modify existing components. The POSITION function lets the designer position or reposition components on a panel. Within the GRAPHICS function there are five subfunctions: NAME, LETTERS, LINE, CIRCLES, and OUTLINES which allow the designer to add panel names and alphanumerics, to draw lines and to add or omit circles and component outlines. The HARD COPY function supplies the designer with a hard copy output of the panel and components currently displayed on the CRT screen. The final function, RECORD, supplies the designer with punched and printed outputs of the panel and component data. The program generates hard copy output as soon as HARD COPY is light penned and PFK 1 is depressed. Printed and punched outputs are generated at the end of the program run.

1.3 REQUIREMENTS

At the Wright-Patterson Air Force Base AFAMRL Human Engineering Systems Simulator facility the PANEL program runs on an IBM 370/155 Operating System computer using a 2250-3 graphic display terminal with light pen, alphanumeric keyboard, and an on-line

Gould 4800 plotter. The program requires 250k bytes of computer memory. IBM System/360 Operating System Graphic Subroutine Package (GSP) for FORTRAN IV is used to create displays on the CRT. Gould 4800/5000 IBM System/360/370 Plot package is used for on-line plotting.

1.4 LOADING THE PANEL PROGRAM

The Job Control Cards to load the PANEL program are shown in Figure 2. The program allows the designer to supply the component data on cards (at the end of the execution deck). The data for each component must be on one card in A4 format. Figure 3 shows an example of card input.

Col	1- 4	Component Number
	5-24	Component Name
	25-28	Component Type
	29-32	Component Width
	33-36	Component Height

A one (1) must be punched in the first column of the very last component card to indicate to the program it is the last input card.

```

//F-0011      JUL      HISS
//          EXEC      PGM=PARML,RTGJON=ZOK
//SYNPF0      00      UNIT=DISK,VOL=SPR=PUBLIC,DISP=ALCO,DSN=HLDLMB
//*           CARO 1PAGE
//F001001     00      SYSDCT=A
//F001001     00      SYSDCT=0
//*           105 015PLAY UNIT 2250-3
//F001001     00      UNIT=2250-3
//G0-SYSDCT   00      SPAGE=TRK,F001,UNIT=SYSDA
//*           PL5AGF UNIT FCK GOULD PLCTTR
//G0-SYSDCT   00      UNIT=GOULD
//G0-SYSDCT   00      SYSDCT=A
//F001001     00      *
//

```

Figure 2. The Job Control Cards for the Panel Program.

01	CIRCULAR SCALF	06	1.0	1.0
02	JUGSILLUK	02	1.0	1.0
03	LIVLE	07	1.0	1.0
04	TIGGLE SWILCH	05	1.0	1.0
1005	EGULAY SWILCH	11	1.0	1.0

Figure 3. Example of Card Input. Note the One (1) in the First Column of the Very Last Card.

SECTION 2

USING THE PANEL PROGRAM

Once the PANEL program is loaded it goes through the initialization state. The different variables are given initial values and the graphic texts are generated for subsequent use in controlling the program flow. It is not necessary to have card input with certain component parameters. The designer can use the CRT interactively to input all the features, data, etc. for each panel.

A required input at the beginning of the execution of the program is the panel number. The program displays the following.

PANEL NO = 0000

The panel number is entered through the ANKB. In general, when a number in an integer format is to be entered, the program displays four zeroes (I4 format) on the CRT screen. The number must be right justified in the four digit field. Otherwise, the entry will be padded on the right with zeroes. For example, if the designer enters "1", it appears on the CRT screen as "1000", and the value for the panel number is one thousand. If the designer enters either "0001" or "bbb1" (b=blank), this means "one". After a desirable number is entered, the ALT-CODE/5 sequence must be depressed. When entering a real number the decimal point must be entered in the desired decimal place.

It one foresees assembling a work station from numerous panels, each would be assigned a unique identifying number before the actual panel design. After the panel is designed and card output is requested, this panel number is one of the data items that is punched on the cards. Then, at later stages, one can easily determine which panel a component belongs to.

After the panel number is entered, the program displays the following.

CARD INPUT:	YES
	NO

The designer must light pen YES if component data are to be read in from cards. NO must be light penned if there is no card input.

Once the initialization of the program is completed, the program comes to what is called the Departure Point (DP). From this departure point, the designer can light pen one of six functions that he/she may wish to use (see Figure 4). These six functions are: OUTLINES, COMPONENTS, POSITION, GRAPHICS, HARD COPY, and RECORD. Each function has its own purpose and use, and will be described separately. The following paragraphs describe the processing of each function.

OUTLINES
COMPONENTS
POSITION
GRAPHICS
HARD COPY
RECORD

Figure 4. Program at Departure Point, Awaiting for One of Six Functions to be Light-Penned.

2.1 OUTLINES

The OUTLINES function is used for generating the shape or the outline of the panel. The designer may select a standard (5.75 inch width) or a special panel by light penning STANDARD or SPECIAL width. The program displays the following.

WIDTH STANDARD SPECIAL

If the designer selects a standard panel, then the program dimensions the width of the panel and the edges as prescribed in Military Standards MS 25212 (ASG) and MS 25213 (ASG). The designer must enter the desired height through the ANKB followed by the ALT-CODE/5 sequence. Then, depress PFK 0.

If the height is not an integer multiple of $\frac{3}{8}$ of an inch, it is increased to the next larger multiple. The minimum height allowed is 1.125 inches and the maximum height is 9 inches. If the designer enters a height value greater than 9 inches, the program reduces it to the maximum height.

When PFK 0 is depressed, the program displays the panel and the mounting holes are introduced and positioned. A panel may get 2, 4, or 6 mounting holes depending on its size. These mounting holes are introduced and positioned on integer multiples of $\frac{3}{8}$ of an inch in the vertical direction. They are positioned horizontally on the edges at the prescribed dimensions. After the outline of the standard panel and the mounting holes are displayed on the CRT screen, the program returns to the Departure Point (DP). In summary, for a standard panel, the designer only enters the desired height and the program generates the panel with the mounting holes. Figure 5 shows several examples of standard panel outlines.

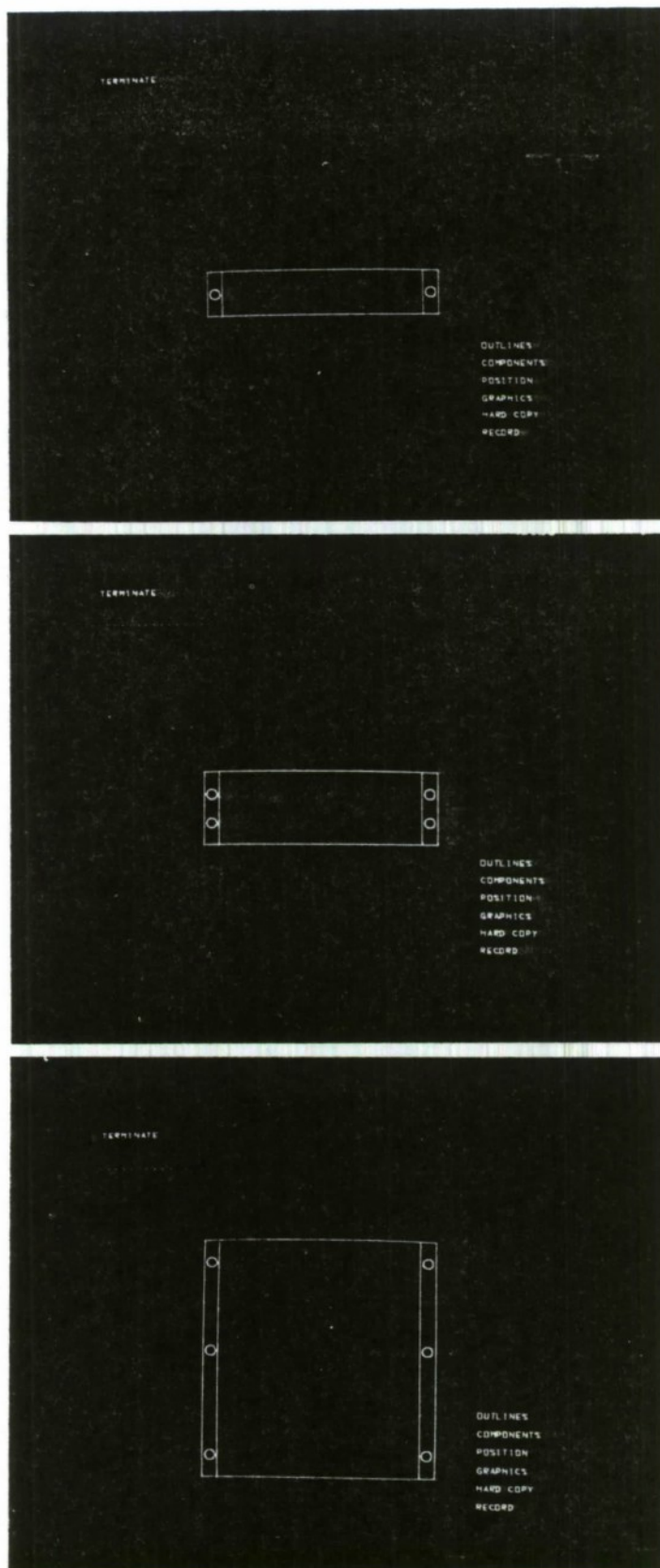


Figure 5. Examples of Standard Panel Outlines with Mounting Holes. Note That the Panel May Get 2, 4, or 6 Mounting Holes Depending on its Size.

If the designer selects the special panel, the program will request the width of the panel, the width of the edge, and the height. The designer must enter each value through the ANKB followed by the ALT-CODE/5 sequence. For the special panel there are no limits for the dimensions of the panel, but the program will display only a 12 x 12 inch area on the CRT screen. These dimensions of the panel are recorded and are included in the printed and punched outputs. The panel is used for mounting components, and the edge is for attaching the panel to the structure of the work station in which the panel is to be used. After that the program produces a rectangular outline sized according to the input dimensions without mounting holes. The program returns to the Departure Point (DP).

2.2 COMPONENTS

The COMPONENTS function is used for adding new components, and/or modifying existing components. When the designer light pens COMPONENTS, the number of the existing components is increased by one and displayed on the CRT screen as follows.

COMPONENT NO = 11

For example, if n components already exist, the program displays n+1 for the new component number. To add a new component the designer must depress the ALT-CODE/5 sequence. Each component that is mounted on or associated with a panel retains this identifying number. After the component number is entered, the designer

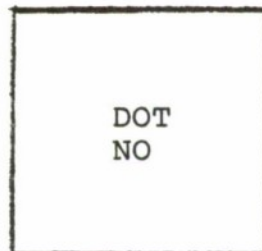
must enter the component name (up to 20 characters) followed by the ALT-CODE/5 sequence. The program then displays a list of 14 component types (see Figure 6). The designer must light pen one of them. After selecting the applicable type, the designer must enter the width and height of the component in inches. Each value must be entered through the ANKB followed by the ALT-CODE/5 sequence.

To modify an existing component the designer must enter the component number through the ANKB followed by the ALT-CODE/5 sequence. This number must be less than the displayed n+1. The program displays the name of that component, if no change is desired the designer must depress the ALT-CODE/5 sequence. The list of 14 component types is displayed and the designer proceeds in the same way as for adding a new component.

After the design of a component is complete, a dot representing the component appears on the CRT screen in the upper left corner (see Figure 5) and the program returns to the DP.

2.3 POSITION

The POSITION function is used to position or reposition components on a panel. When the designer light pens POSITION the program displays DOT and NO (number) to identify which component is to be positioned as follows.



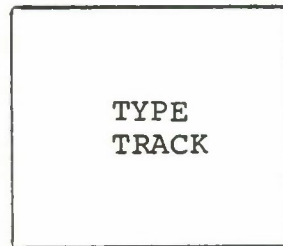
If the designer light pens DOT, he/she must light pen one of the dots in the upper left corner of the CRT screen. Each dot identifies a specific component which is either read in or designed through

16	STARTER SWITCH
CIRCULAR SCALE	
SEMICIRCULAR SCALE	
LINEAR SCALE	
DIGITAL DISPLAY	
LIGHTS-INDC-WARN	
LIGHT SCOPES	- TEXT
LABELLING	
JOYSTICK	
LEVER	SELECTOR
ROTARY	
KNOB	
CRANK	
PUSHBUTTON	
TOGGLE SWITCH	

Figure 6. List of the 14 Component Types Available for the Designer. Note the Component Number and Name at the Top.

the COMPONENT function (dot 1 identifies component 1, dot 2 identifies component 2, etc.). If the designer light pens NO, he/she must enter the component number through the ANKB followed by the ALT-CODE/5 sequence. A circle will appear around the identified dot. This is the standard identification sequence.

To position or reposition the component the program displays TYPE and TRACK as follows.



If TYPE is light penned the designer must enter the coordinates of the desired location of the component through the ANKB followed by the ALT-CODE/5 sequence after each number. If TRACK is light penned the designer must use the "+" symbol (see Paragraph 2.7) to position the component at the desired location.

The X and Y coordinates of the "+" symbol are displayed continuously on the CRT screen except while the "+" is in the run mode as described in Paragraph 2.7.

When the desired location is achieved the designer must depress PFK 14. The component's center point and outline are then displayed. This is a temporary check-out location. If two or more components are on the panel, the program calculates the distance between their outlines. This distance is checked according to prescribed MIL-SPEC distances and those that are found to be too close are marked with an asterisk as shown in Figure 7. The component outline serves as a visual check for how the component will fit with respect to other components, panel edges, etc. The designer can then relocate the component or leave it at the selected location.

TERMINATE

FINISHED MOVE

.....

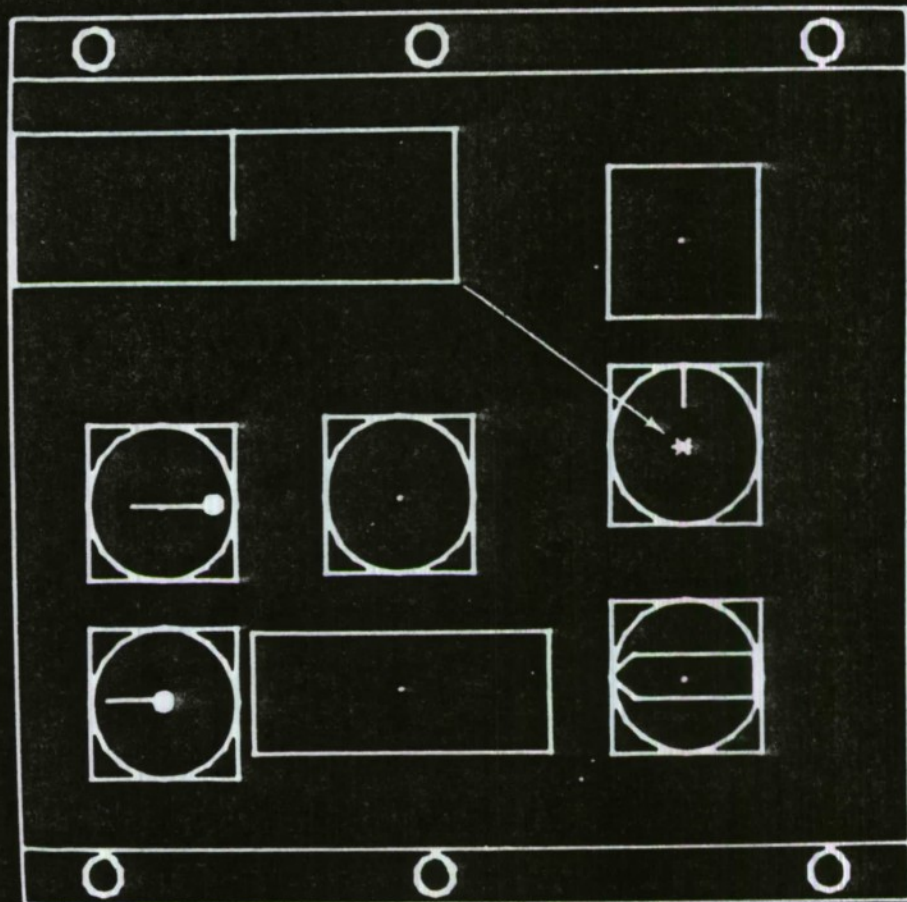


Figure 7. An Asterisk is Displayed to Indicate that the Two Components Outlines are Too Close According to the Prescribed MIL-SPEC Distances.

The designer can reposition the component by light penning MOVE (see Figure 8). The "+" will be displayed on the component regardless of whether the current location was achieved by TYPE or TRACK. When the designer is satisfied with the position of the component, he/she light pens FINISHED. At this point, a symbolic representation of the component appears on the CRT screen (see Figure 9) and the program returns to the DP.

2.4 GRAPHICS

The GRAPHICS function is used to enter panel names (not to be confused with component names), to add alphanumerics, to draw lines, to add or omit circles, and to omit or include component outlines. Upon light penning GRAPHICS, the CRT screen is formatted as shown in Figure 10. The designer can select one of the five subfunctions displayed on the lower right side of the CRT screen.

2.4.1 The NAME Subfunction

If the designer light pens the NAME subfunction, a cursor is displayed on the right side of the CRT screen. The desired character is entered through the ANKB followed by the ALT-CODE/5 sequence and is positioned horizontally, vertically, or diagonally using the "+" symbol. This procedure is repeated until all characters of the panel name are entered and positioned. An example is shown in Figure 11. Later, if the RECORD function (see Paragraph 2.6) is activated, all characters are printed and are punched on the panel card. The designer must light pen COMPLETE to return to GRAPHICS, or after the 20th character has been entered the program automatically returns to GRAPHICS and disallows further entries.

2.4.2 The LETTERS Subfunction

The LETTERS subfunction is similar to the NAME subfunction in that the designer enters the alphanumeric characters one at a time through the ANKB followed by the ALT-CODE/5 sequence. The letters are positioned as described above. The

TERMINATE

FINISHED MOVE

.....

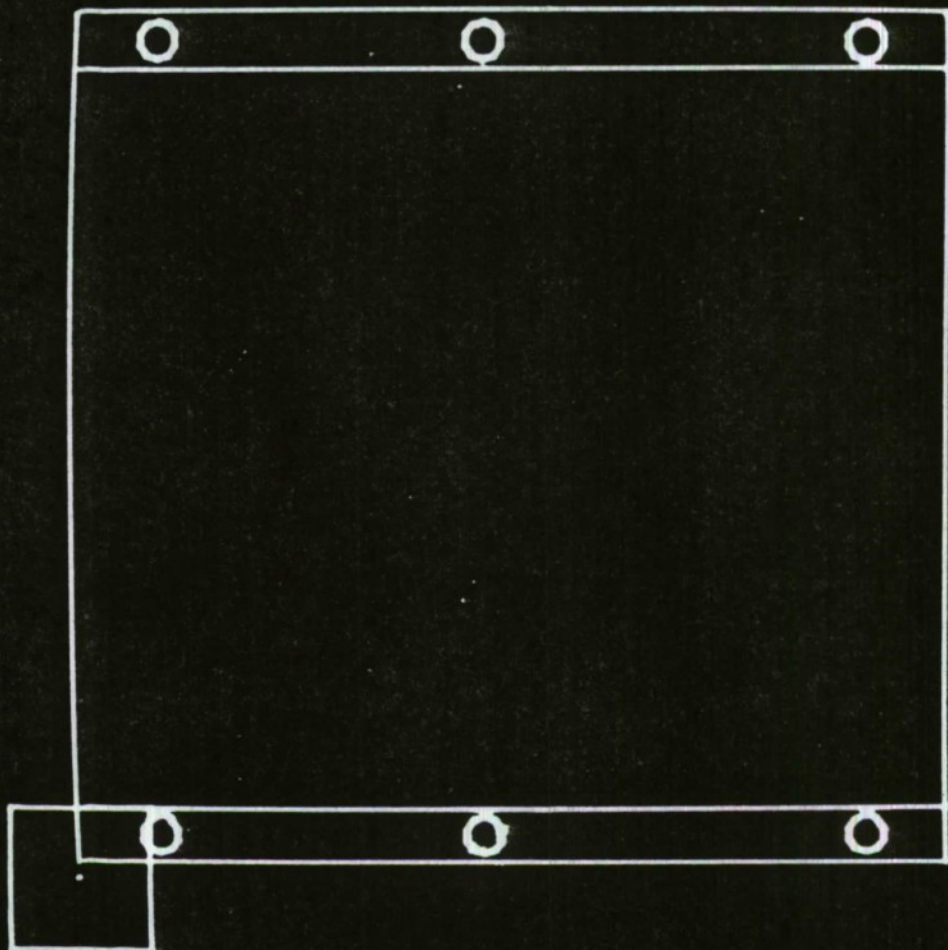
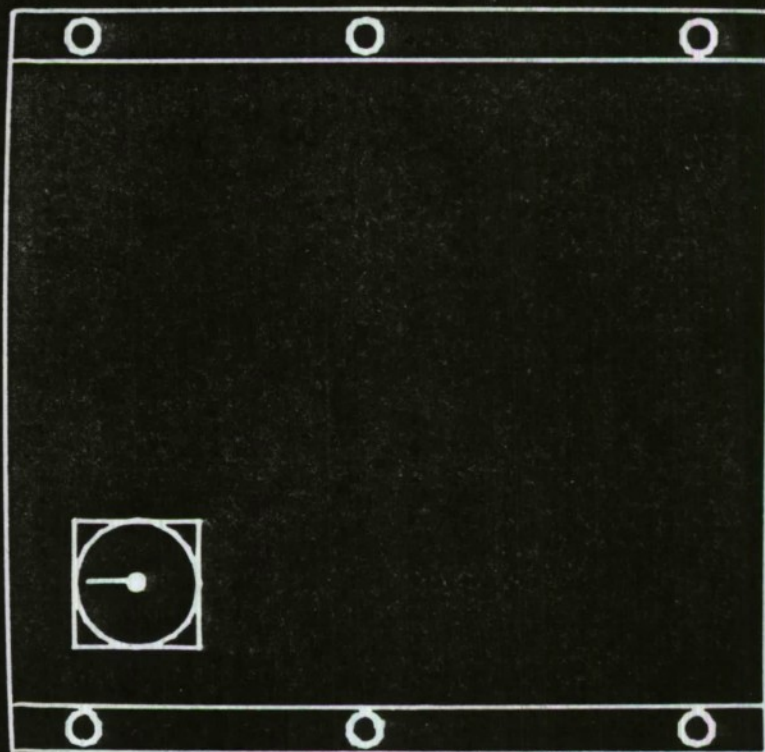


Figure 8. The Designer May Light-Pen FINISHED or MOVE. FINISHED: To Indicate the Final Location of the Component. MOVE: To Reposition the Component.

TERMINATE

.....

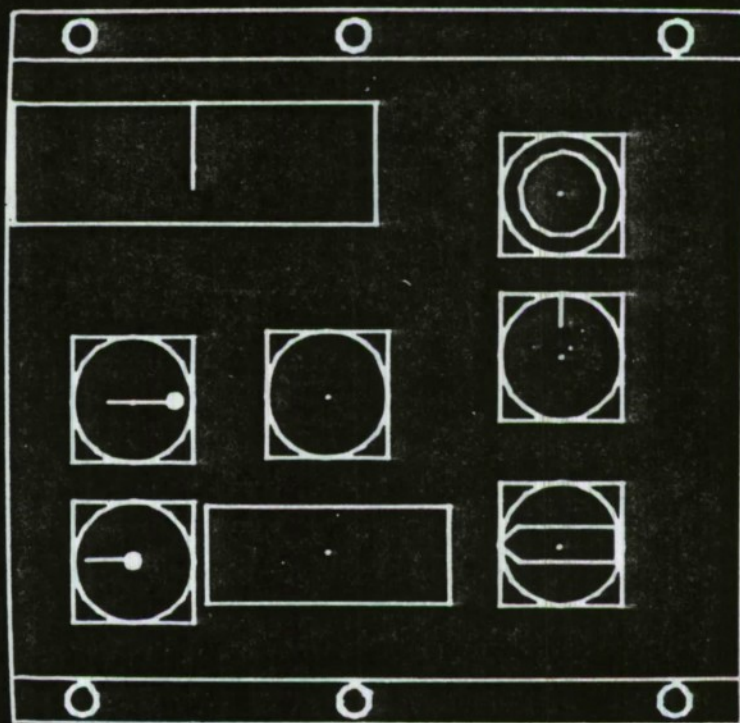


OUTLINES
COMPONENTS
POSITION
GRAPHICS
HARD COPY
RECORD

Figure 9. A Symbolic Representation of the Component is Displayed After FINISHED Has Been Light-Penned.

TERMINATE

.....

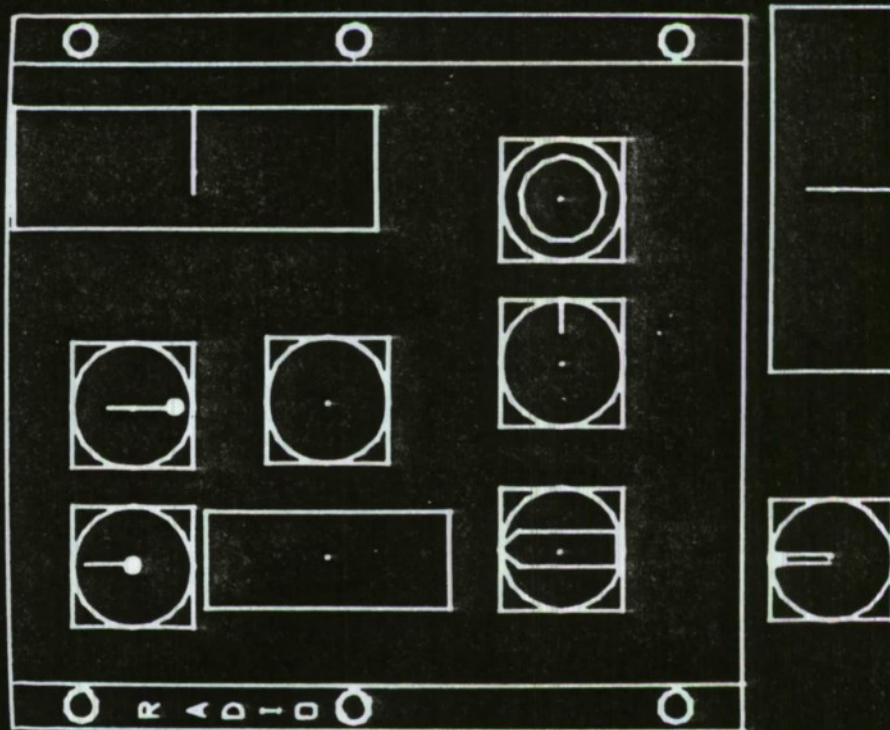


NAME
LETTERS
LINE
CIRCLES
OUTLINES
COMPLETE

Figure 10. List of Graphics Subfunctions and Examples of the Graphic Representation of Types of Components. The Two Bottom Components Illustrate the Ability to Locate Components Outside the Panel Outline.

TERMINATE

.....



COMPLETE

Figure 11. Example of Using the NAME Subfunction.

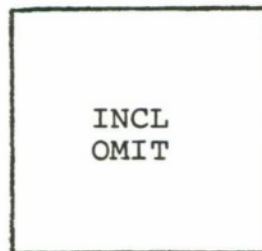
difference is that the program returns to GRAPHICS after each enter-position sequence, and the characters entered with the LETTERS subfunction are not punched when the RECORD function is activated but are printed with their coordinates indicated. The LETTERS subfunction is most frequently used to place letters or numbers on or near the individual components.

2.4.3 The LINE Subfunction

The LINE subfunction is used to draw lines which may be used by themselves or to design panels and components of different shapes (other than the standard ones). After light penning LINE, the designer must define the two endpoints of the line using the "+" symbol and depressing PFK 14 after positioning each point. When PFK 14 is depressed after the positioning of the second endpoint, the program draws a straight line between the two endpoints, and returns to GRAPHICS.

2.4.4 The CIRCLES Subfunction

The CIRCLES subfunction is used to omit and/or add circles. If the designer light pens CIRCLES, the program displays INCL and OMIT as follows.



If the designer wishes to omit a circle, he/she must light pen OMIT, then light pen the circle to be omitted. The program then removes that circle from the display and returns to GRAPHICS.

To add a circle the designer must light pen INCL and enter the radius (a real number with a decimal point) of the new circle. The program displays COMPONENT and XHAIR as follows.



COMPONENT
XHAIR

If the designer wishes to add a circle that is associated with a component, he/she must light pen COMPONENT. If the designer light pens COMPONENT, the program displays DOT and NO (number) as follows.



DOT
NO

If the designer light pens DOT, he/she must light pen the center point of the components to which he/she wants the circle added. If the designer light pens NO, he/she must enter the component number to which he/she wants the circle added using the ANKB followed by the ALT-CODE/5 sequence. The circle is added to the component with the center of the circle at the center of the component. The program will then return to GRAPHICS.

To add an independent circle the designer must light pen XHAIR, and position the "+" symbol where he/she wants the center of the circle to be. When PFK 14 is depressed, the program displays a circle centered at that indicated point and the program returns to GRAPHICS. By using the LINE or CIRCLES sub-functions, the designer can create any complex component shape, but they cannot be moved about as a single component.

2.2.5 The OUTLINES Subfunction

The OUTLINES subfunction is used to omit or include the rectangular outline of a component. To omit an outline of a component the designer must light pen OMIT. To restore an outline of a component the designer must light pen INCL. In either case, the program displays DOT and NO on the CRT screen. The designer may light pen either and then proceed in the same manner as described in Paragraph 2.4.4. The program then returns to GRAPHICS.

Note that the program remains in the GRAPHICS function rather than returning to the Departure Point after the use of any of the subfunctions. The designer must light pen COMPLETE to return the program to the Departure Point.

2.5 HARD COPY

The HARD COPY function generates a hard copy of the panel and components currently displayed on the CRT screen. When the designer light pens HARD COPY an enlarged picture appears on the CRT screen. This is necessary because in transferring from the CRT to the Gould plotter the picture is reduced in size. When PFK 1 is depressed, the plotter generates the image of the picture in full size. The program then returns to the DP. The HARD COPY function uses the plotting program SCOPEDUMP which was originally written for AFAMRL by ENSCO Inc., Springfield, VA, and is used to transfer images from an IBM 2250 CRT to a Gould plotter. SCOPE-DUMP is not supplied with this guide.

2.6 RECORD

The RECORD function prints and punches panel and component data. The punched output consists of a card for the panel data and a card for each component. These cards are formatted so that they can be used in future program runs so that the designer need not start from scratch. Figure 12 shows an example of the punched output. The printed output contains panel data such as size,

COMPONENT NUMBER		TYPE OF COMPONENT	X, Y COORDINATES	PANEL NUMBER
1	CIRCULAR SCALE	1	1.0 1.0	10
2	SEMICIRCULAR SCALE	2	1.0 1.0	10
3	LINEAR SCALE	3	1.0 2.0	10
4	COUNTER	4	1.0 1.0	10
1005	LIGHTS	5	1.0 1.0	10

Notice a one (1) must be typed in the first column of the last component.

Figure 12. Example of Punched Output.

number, and location of the mounting holes. It also contains the component data and all the graphic components such as lines, letters, etc., with their coordinates. Figure 13 shows an example of the printed output. The program then returns to the DP.

2.7 USING THE CROSS SYMBOL ("+") (TRACK)

The cross symbol ("+") is used for locating or positioning a point on the CRT in a two-dimensional coordinate system. The program displays the cross symbol where it was left during its previous usage, or at the center of the CRT at the initialization of the program. Positioning the "+" is achieved using the Program Function Keys (PFKs). The direction of movement is indicated inside the circles representing the PFKs in Figure 14. By selecting the proper directional PFK, the "+" can be moved up, down, left, or right. If PFK 4 is depressed after a directional PFK, the "+" will run continuously in the direction indicated. This is called the run mode. Once in continuous motion (run mode), the direction of movement of the "+" can be changed simply by depressing another directional PFK. The motion of the "+" may be stopped by depressing PFK 6 or PFK 8. Then, by depressing a desired directional PFK the designer may move the "+" one step at a time (step mode).

When TRACK is selected, the increment value is set equal to 0.01 inches. The increment or step size can be increased by depressing PFK 9 or decreased by depressing PFK 15 repeatedly by a factor of ten. Thus, by selecting the proper step value one can achieve rapid traverse of movement, as well as highly accurate positioning of the "+". The increment change affects both the run and the step mode.

While operating in the step mode, the current X and Y coordinates of the "+" as well as the size of the increment are displayed. When control is returned to the calling program, the X and Y values are transferred to the calling program for its use. These values of the coordinates of the "+" are maintained in the subroutine XHAIR (see Appendix A). Upon the next entry to the program, the "+" starts at its previously defined position.

PANEL NAME = ABCDEF PANEL NO = 10
 PANEL OUTLINE: HEIGHT = 9.000 WIDTH = 5.750 MARGIN = 0.375

A B C D E F
 X = -2.68 -2.68 -2.68 -2.68 -2.68 -1.98
 Y = 2.99 2.64 2.24 1.84 1.44 1.04

MOUNTING HOLE(S): 6
 X = -2.68 2.68 2.68 -2.68 -2.68 2.68
 Y = -2.94 3.94 -3.94 3.94 0.19 0.19

COMPONENT LISTING

NO	NAME	TYPE	WIDTH	HEIGHT	DEPTH
1	CIRCULAR SCALE	1	1.00	1.00	1.00
2	SEMICIRCULAR SCALE	2	1.00	1.00	1.00
3	LINEAR SCALE	3	1.00	2.00	1.00
4	COUNTER	4	1.00	1.00	1.00
5	LIGHTS	5	1.00	1.00	1.00
6	INT. SCOPES	6	1.00	1.00	1.00
7	LABELLING	7	1.00	1.00	1.00
8	JOYSTICK	8	1.00	1.00	1.00
9	LIVAR	9	1.00	1.00	1.00
10	ROTARY SELECTOR	10	1.00	1.00	1.00
11	KNOB	11	1.00	1.00	1.00
12	CRANK	12	1.00	1.00	1.00
13	PUSHBUTTON	13	1.00	1.00	1.00
14	TOGGLE SWITCH	14	1.00	1.00	1.00
15	LINEAR SCALE	3	2.50	0.90	1.00
16	.	10	2.00	2.00	2.00

Figure 13. Example of Printed Output.

```

CIRCLES = 13
X CNTR = -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00
Y CNTR =  3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00   3.00
RADIUS =  0.50   0.05   0.05   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50
COMPNT =  1      1      2      2      5      10     13     13     14     16     16     16     6

X CNTR =  0.73
Y CNTR = -1.53
RADIUS =  0.50
COMPNT =  11

LINES = 19
X STRT = -4.00  -4.00  -4.20  -4.20  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00
Y STRT =  3.00   3.00   1.00  -1.00  -3.45  -3.45  -3.45  -3.45  -3.45  -3.45  -3.45  -3.45  -3.45
X FIN = -4.00  -4.00  -3.50  -3.50  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00  -4.00
Y FIN =  3.40   1.20  -1.00  -1.00  -2.82  -2.82  -2.79  -2.79  -3.59  -3.59  -3.59  -3.59  -3.59
COMPNT =  1      2      3      3      15     10     10     10     10     10     10     10     10

X STRT =  3.04   3.04   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44
Y STRT =  2.76   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16
X FIN =  3.04   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44   2.44
Y FIN =  1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16   1.16
COMPNT =  16     16     16     16     16     16     16     16     16     16     16     16     16

CHARACTERS = 2
CHAR = G H
X = 4.43 4.43
Y = 1.84 1.48

```

Figure 13. Example of Printed Output (Concluded).

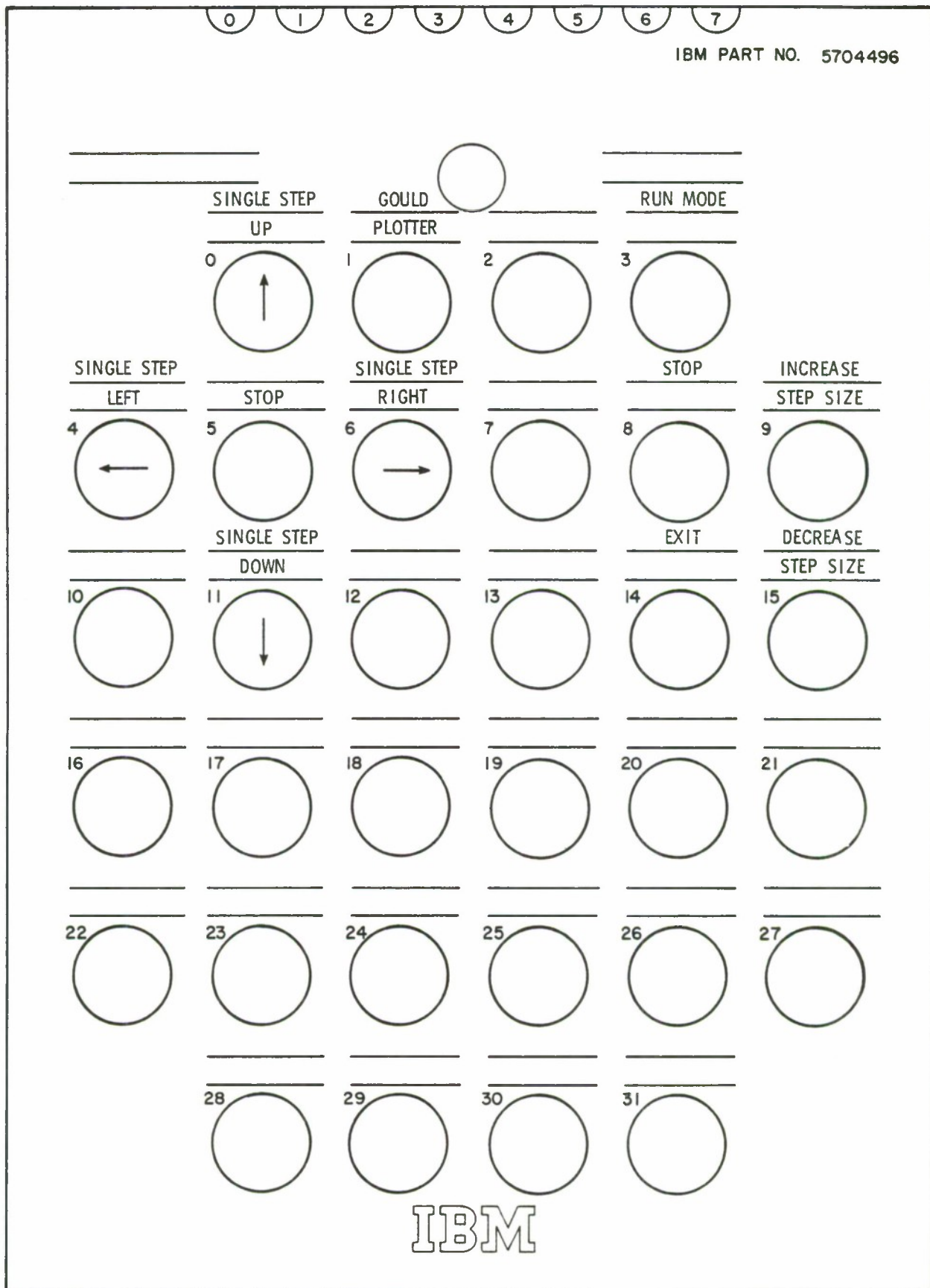


Figure 14. Defined Program Function Keys for Positioning the "+" Symbol.

APPENDIX A

PANEL LISTING

The PANEL program consists of a main program and eight subroutines. Their functions are briefly described in the following paragraphs.

Subroutine XHAIR

Subroutine XHAIR is used for positioning the cross symbol ("+") on the CRT screen in a two-dimensional coordinate system. When XHAIR is first recalled, the "+" symbol is displayed at the center of the screen (coordinate point (0,0)). Upon the next call to XHAIR, the "+" symbol is displayed at the previously defined position. The initial step size or increment value of the "+" symbol is set equal to 0.01 inches. It can be increased or decreased by a factor of ten by using the proper PFK (see Paragraph 2.7). By selecting the proper PFK (see Paragraph 2.7), the "+" symbol can be moved up, down, left, or right.

Subroutine ROUND

Subroutine ROUND is used for generating circles. The program supplies a control number (positive integer) for each circle generated which is used to identify the circle type. A zero control number implies a circle has been omitted or "erased". Circles that represent mounting holes for panels have a control number value of 2. Circles that are associated with components (as used in the symbolic representations of subroutine MENU) have a control number equal to the component number plus 100. All other circles have a control number equal to one.

A circle is produced by using a straight line segment approximation. A circle is made up of a minimum of 10 segments. For a radius larger than 0.25 inches, the number of segments is calculated by multiplying the radius time 40, up to a maximum of 40 edges. The circles are numbered consecutively in the order they are generated and given a correlation value equal to the circle number plus 100. This is distinct for the control number and is used for LP identification of circles.

Subroutine COMPRS

Subroutine COMPRS is used to eliminate unused data from arrays associated with circles to prevent overflow. It checks through the control number array. Whenever it finds a zero, it copies the data from the next storage location into the current location. It does this for all arrays associated with the circles and for all locations up to the number of circles. At the end of this copying, the number of circles is reduced by one. The next location is checked and the process is repeated until all control numbers have been checked and all unused (zeroed) storage locations have been filled.

Subroutine MENU

Subroutine MENU generates symbolic component shapes so that a realistic looking panel can be produced and serves as an identification of the components for the designer. To insure that the previous image of a recently moved component does not appear, the subroutine initially zeroes out (erases) all lines and circles that are associated with the component currently under consideration. The subroutine scales the lines and circles of each component according to the supplied width and height. Note that this subroutine computes the parameters for the various lines and circles, but they are projected in subroutine RESTOR.

Subroutine COMPO

This subroutine projects the center point and the rectangular outline of all components. It can be selectively used with either a standard or an enlarged data set to produce either a life-size or enlarged picture. The program does the selecting.

Subroutine RESTOR

Subroutine RESTOR produces and projects on the CRT screen the indicated number of letters (or alphanumeric characters), lines, circles, and names. Similarly to subroutine COMPO, it can be selectively used with either the standard or the enlarged data set.

Subroutine ADCIR

Subroutine ADCIR is used in conjunction with subroutine MENU to compute the parameters for circles associated with a component.

Subroutine IDENT

Subroutine IDENT is used to identify components the designer chooses. When entering this subroutine, the designer must make a choice to either light pen the dot which represents the component, or type in the identifying number of the component. Once this choice is made, the program proceeds to the corresponding section of the subroutine where the indicated action is carried out.

```

0001  DIMENSION LLEN(10), X(10), Y(2), PL(20), D(1,7,7),
      1  FNM(250), FXY(70), SPACE(12), XA(100), YA(100),
      2  RA(100), LA(100), XB(150), YB(50)
      INTEGER IA
      COMMON /A/  NCOMP, XC(50), YC(50), WID(150), HGT(50), MOVE(50)
      COMMON /B/  NO(11), LEVL, LUG, IDEVL, XH, YH
      COMMON /C/  IGB, IGLA, IGLY, IGD
      COMMON /D/  RAD(100), XCR(100), YCR(100), MCIR(100), NCIRC
      COMMON /E/  IYIP(50), LLIR, LINE, MLIN(50)
      COMMON /F/  TXL(50), XL(50), YL(50), XS(50), YS(50), XF(50), YF(50)
      COMMON /G/  FNM(20), XPNM(20), YPNM(20), NAMEL
      DATA IAY /'LIRC','ULAR','SCA','LL','SEMI','CIRC','SCA','LE',
      1  'LINE','AR','S','CALE','DIGI','TAL','DISP','LAY','LIGH',
      2  'TS-1','NDC-1','WARN','CRT','SCOP','IES','LABE','LLIN',
      3  'G-','TEXT','JOYS','TICK','LEVE','R',
      4  'ROTA','RY','S','ELEC','TGR','KNEB',
      5  'CRAN','K',
      6  'LE','WIT','H','TS-','SAFE','TY','C','VER','TS','P','ULL',
      7  'U','OVE','BLAN','K','PA','NEL',
      DATA SPACE /10* ' ', 2* '0000' /, TXL / ' ' /
      DATA D / 8*0.0, 2*1.0, 0.0, 0.5, 0.75, 0.0, 3*1.0,
      1  0.0, 0.5, 1.0, 0.0, 3*1.0, 0.0, 0.5, 1.0, 8*0.0, 3*0.5, 0.0,
      2  2*0.5, 0.0, 0.75, 2*1.0, 0.0, 0.5, 0.75 /
      D = SEPARATION, MEASURED BETWEEN ADJACENT EDGES
      HGT = 1.125
      HGP = HEIGHT OF PANEL
      LOGICAL LCA
      LCA = .FALSE.
      LCA = TKUL = PANEL OUTLINE HAS BEEN GENERATED
      NCIRC = 0
      NCIRC = NUMBER OF CIRCLES
      J = 1
      LTR = 0
      LTR = NUMBER OF LETTERS / CHARACTERS
      LTR = 0
      LTR = NUMBER OF LINES
      POINT = 0
      NAMEL = 0
      NAMEL = -5
      NAMEL = 0
      NAMEL = NUMBER OF COMPONENTS
      AD = 0.375
      AD = NUMBER OF EDGE
      XL = 5.000
      XL = NUMBER OF ADJACENT
      XH = 0.0
      XH = 0.0
      YH = 0.0
      YH = 1

```

[illegible]

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MAIN

PROGRAM IV 5 LEVEL 21

```

0069 CALL SUBRM (IGTY, 31)
0070 CALL SDATL (IGA, -6.0, -6.0, 6.6, 6.6)
0071 CALL SDATL (IGB, -6.0, -6.0, 6.0, 6.6)
0072 CALL SDATL (IGC, -4.82, -4.82, 4.82, 4.82)
0073 CALL SDATL (IGD, -6.0, -6.0, 6.6, 6.6)
0074 CALL SDATL (IGX, 0, 0, 74, 52)
0075 CALL SDATL (IGY, 0, 0, 74, 52)
0076 CALL CRATL (IGLVL, LEVI)
0077 CALL FRWIN (LEVI, 0, -15, 32, 34)
0078 CALL SLPAT (IGB, 1)
0079 CALL SLPAT (IGD, 1)
0080 CALL SLPAT (IGX, 1)
0081 CALL SLPAT (IGY, 1)
0082 CALL NLPED (LEVI, 2, 3)

```

GENERAL CONTROL TEXTS

```

0083 CALL PTEXT (IGTX, 'OUTLINES', 8, 1, NO, 2, 62, 20)
0084 CALL PTEXT (IGTX, 'COMPONENTS', 10, 2, NO, 2, 62, 18)
0085 CALL PTEXT (IGTX, 'POSITION', 8, 3, NO, 2, 62, 16)
0086 CALL PTEXT (IGTX, 'GRAPHICS', 8, 4, NO, 2, 62, 14)
0087 CALL PTEXT (IGTX, 'HARD COPY', 9, 5, NO, 2, 62, 12)
0088 CALL PTEXT (IGTX, 'RECORD', 6, 6, NO, 2, 62, 10)
0089 CALL PTEXT (IGTX, 'WIDTH', 5, 20, NO, 2, 30, 50)
0090 CALL PTEXT (IGTX, 'STANDARD', 8, 21, NO, 2, 40, 50)
0091 CALL PTEXT (IGTX, 'SPECIAL', 7, 22, NO, 2, 50, 50)
0092 CALL PTEXT (IGTX, 'CENTER', 6, 23, NO, 2, 30, 48)
0093 CALL PTEXT (IGTX, 'EDGE', 4, 24, NO, 2, 48, 48)
0094 CALL PTEXT (IGTX, 'HEIGHT', 6, 25, NO, 2, 30, 46)
0095 CALL PTEXT (IGTX, 'COMPONENT', 9, 30, NO, 2, 20, 30)
0096 CALL PTEXT (IGTX, 'NAME', 4, 31, NO, 2, 25, 28)
0097 CALL PTEXT (IGTX, 'WIDTH', 5, 33, NO, 2, 23, 26)
0098 CALL PTEXT (IGTX, 'HEIGHT', 6, 34, NO, 2, 22, 24)
0099 CALL PTEXT (IGTX, 'FINISHED', 8, 60, NO, 2, 40, 50)
0100 CALL PTEXT (IGTX, 'MOVL', 4, 41, NO, 2, 50, 50)
0101 CALL PTEXT (IGTX, 'IDENT', 5, 42, NO, 2, 55, 50)
0102 CALL PTEXT (IGTX, 'X =', 3, 43, NO, 2, 30, 50)
0103 CALL PTEXT (IGTX, 'Y =', 3, 44, NO, 2, 50, 50)
0104 CALL PTEXT (IGTX, 'DOT', 3, 45, NO, 2, 68, 61)
0105 CALL PTEXT (IGTX, 'HD', 2, 46, NO, 2, 68, 4)
0106 CALL PTEXT (IGTX, 'TRACK', 5, 47, NO, 2, 68, 4)
0107 CALL PTEXT (IGTX, 'TYPE', 4, 48, NO, 2, 68, 6)
0108 CALL PTEXT (IGTX, 'LETTERS', 7, 50, NO, 2, 66, 16)
0109 CALL PTEXT (IGTX, 'OUTLINES', 8, 51, NO, 2, 66, 10)
0110 CALL PTEXT (IGTX, 'CIRCLES', 7, 52, NO, 2, 66, 12)
0111 CALL PTEXT (IGTX, 'LINE', 4, 53, NO, 2, 66, 14)
0112 CALL PTEXT (IGTX, 'COMPILE', 8, 54, NO, 2, 66, 6)
0113 CALL PTEXT (IGTX, 'OMIT', 4, 55, NO, 2, 66, 6)
0114 CALL PTEXT (IGTX, 'INCL', 4, 56, NO, 2, 66, 6)
0115 CALL PTEXT (IGTX, 'RADIUS =', 8, 57, NO, 2, 46, 50)
0116 CALL PTEXT (IGTX, 'COMPONENTS', 10, 58, NO, 2, 60, 6)
0117 CALL PTEXT (IGTX, 'X HAIR', 6, 59, NO, 2, 60, 4)
0118 CALL PTEXT (IGTX, 'NAME', 4, 60, NO, 2, 66, 18)
0119 CALL PTEXT (IGTX, 'TERMINATE', 9, 99, NO, 1, 3, 51)
0120 CALL PTEXT (IGTX, 'PANEL NO =', 10, 61, NO, 1, 26, 20)
0121 CALL EXEC (IGTX)

```

DATA PANEL NUMBER

ESTABLISH OUTLINES FOR THE PANELS

C

C

100

CONTINUE

CALL INCL (IGTX, 20)

CALL INCL (IGTX, 21)

CALL INCL (IGTX, 22)

ICA = .TRUE.

CALL RCATN (LEVI, LOC, 2, LPEN, 34)

CALL OMIT (IGTX, 20)

CALL OMIT (IGTX, 21)

CALL OMIT (IGTX, 22)

K = LPLN (4)

IF IK .EQ. 21 GO TO 105

IF IK .EQ. 22 GO TO 106

GO TO 1

STANDARD WIDTH

CONTINUE

XM = 5.000

XD = 0.375

GO TO 110

SPECIAL WIDTH

CONTINUE

CALL INCL (IGTX, 23)

CALL INCL (IGTX, 24)

CALL RCNV (XM, PL (1), 102, 8, 3)

CALL RCNV (XD, PL (3), 102, 8, 3)

CALL PTEXT (IGTX, PL (1), 8, 1, NO, 1, 37, 48)

CALL PTEXT (IGTX, PL (3), 8, 2, NO, 1, 56, 48)

CALL EXEC (IGTX)

CALL ICURS (IGTX, 11)

CALL RCATN (LEVI, LOC, 2, NO, 32)

CALL RCURS (IGTX)

CALL ICURS (IGTX, 21)

CALL RCATN (LEVI, LOC, 2, NO, 32)

CALL GSPRD (IGTX, PL, 16, 1)

CALL RCURS (IGTX)

CALL RSLT (IGTX)

CALL RCNV IPL (1), XM, 202, 8, 2)

CALL RCNV (PL (3), XD, 202, 8, 4)

CALL OMIT (IGTX, 23)

CALL OMIT (IGTX, 24)

ESTABLISH MARGINS

CONTINUE

X (1) = 0.50 * XM

X (2) = - X (3)

X (4) = X (3) + XD

X (1) = - X (4)

XT = XM + 2.0 * XD

XM = WIDTH OF CENTER PART

XD = WIDTH OF LEFT (ON ONE SIDE)

XT = TOTAL WIDTH

ENTER HEIGHT

CALL INCL (IGTX, 25)

CALL RCNV IPL, PL, 102, 8, 3)

CALL PTEXT (IGTX, PL (1), 8, 3, NO, 1, 38, 48)

CALL EXEC (IGTX)

CALL ICURS (IGTX, 3)

CALL RCATN (LEVI, LOC, 2, NO, 32)

CALL RCURS (IGTX)

CALL ICURS (IGTX, 3)

CALL RCATN (LEVI, LOC, 2, NO, 32)

00002350

00002350

00002350

00002360

00002370

00002380

00002390

00002400

00002410

00002420

00002430

00002440

00002450

00002460

00002470

00002480

00002490

00002500

00002510

00002520

00002530

00002540

00002550

00002560

00002570

00002580

00002590

00002600

00002610

00002620

00002630

00002640

00002650

00002660

00002670

00002680

00002690

00002700

00002710

00002720

00002730

00002740

00002750

00002760

00002770

00002780

00002790

00002800

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00002840

00002850

00002860

00002870

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00002900

00002910

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MAIN

FUNCTION (V, L, LEVEL, Z)

```

0213 CALL GSPRD (IG(Y, PL, 8, 11) 00002910
0213 CALL RCUKS (IG(Y) 00002920
0220 CALL RESET (IG(Y) 00002930
0221 CALL BCNV (PL (1), HGTP, 202, 8, 21 00002940
0222 IF (K - EQ, 221 GO TO 130 00002950
      CHECK IF HEIGHT IS MULTIPLY OF 0.375 00002960
      K1 = 2 00002970
      CONTINUE 00002980
0223 K1 = K1 + 1 00002990
0224 HGTH = K1 * 0.375 00003000
0225 IF (FGTH - LT, HGTP) GO TO 120 00003010
0226 HGTP = HGTH 00003020
0227 IF (FGTP - GT, 9.01 FGTP = 9.0 00003030
0228 CALL BCNV (HGTP, PL, 102, 8, 31 00003040
0231 CALL PTEXT (IG(Y, PL (1), 8, NU, NU, 1, 38, 40) 00003050
0232 CALL EXEC (IG(Y) 00003060
0233 CALL MLTIS (DEVL, 4, 01 00003070
0234 CALL RQATN (LEV1, LUC, 2, NU, 01 00003080
0235 CALL RESET (IG(Y) 00003090
0236 CALL MLTIS (DEVE, 2) 00003100
      PROJECT OUTLINE 00003110
      CONTINUE 00003120
0237 Y (11) = 0.50 * HGTP 00003130
0238 Y (21) = -0.50 * FGTP 00003140
0239 CALL RESET (IGAL 00003150
0240 CALL PSGM (IGA, X (11), Y (11), X (41), Y (11) 00003160
0241 CALL PSGM (IGA, X (11), Y (21), X (41), Y (21) 00003170
0242 CALL PSGM (IGA, X (11), Y (11), X (11), Y (21) 00003180
0243 CALL PSGM (IGA, X (21), Y (11), X (21), Y (21) 00003190
0244 CALL PSGM (IGA, X (31), Y (11), X (31), Y (21) 00003200
0245 CALL PSGM (IGA, X (41), Y (11), X (41), Y (21) 00003210
      ELIMINATE PREVIOUS MOUNTING HOLES 00003220
      MOUNT = 0 00003230
      IF (INCIRC - LT, 21 GO TO 132 00003240
      DO 132 IOL = 1, NCIRC 00003250
      IF (NCIR (LEI - EQ, 21 NCIR (IOL) = 0 00003260
      CONTINUE 00003270
      IF (NCIRC - GT, 101 CALL COMPRS 00003280
      IF (K - EQ, 221 GO TO 150 00003290
      M = 1 (FIRST MOUNT HOLE M1 = (AST MOUNT HOLE 00003300
      R = NCIRC + 1 00003310
      XCR (M) = -2.6825 00003320
      XCR (M+1) = 2.6825 00003330
      YCR (M) = Y (21) + 0.5625 00003340
      YCR (M+1) = -YCR (M) 00003350
      MOUNT = 2 00003360
      M1 = R + 1 00003370
      NCIRC = NCIRC + 2 00003380
      IF (Y (11) - LT, 0.761 GO TO 154 00003390
      PANELS HIGHER THAN 1.50 INCHES GET 3 HOLES 00003400
      XCR (M+2) = 2.6825 00003410
      XCR (M+3) = -2.6825 00003420
      YCR (M+2) = YCR (M) 00003430
      YCR (M+3) = -YCR (M) 00003440
      MOUNT = 4 00003450
      R1 = R + 3 00003460
      NCIRC = NCIRC + 2 00003470
      YOLF = ABS (YCR (M+3) - YCR (M1) 00003480

```

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LIBRAN IV 5 LEVEL 2)

```

0271 IF YDIF .LT. 4.871 GO TO 154
0272 COUNT = 6
0273 M1 = N + 5
0274 NLCRC = NLCRC + 2
0275 XCR IM+4) = -2.6825
0276 XCR IM+5) = 2.6825
      GO ON EVEN NUMBER OF SPACES
C
0277 A2 = 1.000
      CONTINUE
145
0278 TUS1 = 0.375 * A2
0279 IF JAGS YDIF - ILS1 .LT. 0.05) GO TO 152
0280 A2 = A2 + 1.0JC
0281 ILS) = 0.375 * A2
0282 IF JALS YDIF - IFS1 .LT. 0.05) GO TO 150
0283 A2' = A2 + 1.0JC
      GO TO 145
150
0284 CONTINUE
      YCR IM+4) = 0.0
      YCR IM+5) = 0.0
      GO TO 154
152
0285 CONTINUE
      YCR IM+4) = 0.1875
      YCR IM+5) = 0.1875
154
0286 CONTINUE
      NCTR = 2 IDENTIFIES MOUNTING HOLES
      DO 156 JDL = M, M1
0287 RAL JDL) = 0.129
0288 NCTR JDL) = 2
      CALL ROUN JDL, 16A)
      CONTINUE
156
158
0289 CALL EXEC IIGA)
0290 CALL CMT IIGTX, 25)
      GO TO 1
C
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C
      SELECT THE COMPONENTS TO BE INCLUDED IN THE PANEL
C
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C
      CONTINUE
200
0303 IF JICA) CALL CMT IIGA)
0304 CALL RESI IIGB)
0305 CALL RESI IIGD)
0306 NCAP = NCMP + 1
0307 CALL INC IIGX, 30)
      COMPONENT NUMBER
C
0308 CALL RCHV NCMP, PL, 1G3, 4)
0309 CALL PTEX IIGTY, PL 1), 4, 1, 80, 1, 30, 30)
0310 CALL EXEC IIGTY)
0311 CALL ICORS IIGTY, 1)
0312 CALL RQAIN ILEV1, LOC, 2, NC, 12)
0313 CALL CSPRO IIGTY, PL, 4, 1)
0314 CALL ICORS IIGTY)
0315 CALL PLEXI IIGR, PL11), 4, NC, ND, 1, -1.0, 5.6)
0316 CALL EXEC IIGB)
0317 CALL RESI IIGTY)
0318 CALL RCHV PL 11), 1, 203, 4)
0319 CALL CMT IIGTX, 30)
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0373 CALL UNIT (IGTX, 33)
0374 CALL UNIT (IGTX, 34)
0375 IF (ICAD) CALL INCL (IGA)
0376 CALL COMPU (IGD)
0377 CALL RESIGN (IGL)
0378 GO TO 1

C      X      -      X      -      X      -      X
C
C      POSITION THE COMPONENTS ON THE PANEL WITH
C      FI) - INTERFERENCE CONSIDERATIONS
C
C300 CONTINUE
CALL IDINT (I)
IF (I .GT. NCOMP) I = NCOMP
I = IDENTITY OF COMPONENT TO BE MOVED
CALL PTEXT (IGD, 'U', 1, 100, NU, 1, XC (I), YC (I))
CALL EXEC (IGB)
CALL INCL (IGTX, 47)
CALL INCL (IGTX, 48)
CALL RCATN (LEVI, LUC, 2, LPEN, 34)
CALL UNIT (IGTX, 47)
CALL UNIT (IGTX, 48)
IF (LPEN 14) .EQ. 47) GO TO 320
IF (LPEN 14) .EQ. 48) GO TO 310
GO TO 1

C      ENTER X AND Y COORDINATES
C310 CONTINUE
CALL RESET (IGTY)
CALL INCL (IGTX, 43)
CALL INCL (IGTX, 44)
CALL BCNV (XC (I), PL (I), 102, 8, 3)
CALL BCNV (YC (I), PL (I), 102, 8, 3)
CALL PTEXT (IGTY, PL (I), 8, 1, NU, 1, 35, 50)
CALL PTEXT (IGTY, PL (I), 8, 2, NU, 1, 55, 50)
CALL EXEC (IGTY)
CALL LCURS (IGTY, 1)
CALL RCATN (LEVI, LUC, 2, NU, 32)
CALL RCURS (IGTY)
CALL LCURS (IGTY, 2)
CALL RCATN (LEVI, LUC, 2, NU, 32)
CALL RCURS (IGTY)
CALL BSPRD (IGTY, PL, 16, 1)
CALL RESE (IGTY)
CALL UNIT (IGTX, 43)
CALL UNIT (IGTX, 44)
CALL BCNV (PL (I), XC (I), 202, 8)
CALL BCNV (PL (I), YC (I), 202, 8)
GO TO 330

C      POSITION CROSS-HAIR ON COMPONENT
C315 CONTINUE
XI = XC (I)
YI = YC (I)
USE TRACKING SYMBOL

C320 CONTINUE
CALL XHAIR
XC (I) = XI
YC (I) = YI

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0421 CONTINUE
0422 MOVE (1) = .FALSE.
0423 CALL COMPO (IGB)
      CHECK FOR STANDARD CONTROL SUPPLEMENT
0424 IF (ITYP (1) .EQ. 7) GO TO 350
0425 J1 = ITYP (1) - 7
0426 DO 340 IOL = 1, NCOMP
0427   IF (1 .EQ. IOL .OR. ITYP (IOL) .EQ. 7) GO TO 340
0428   J2 = ITYP (IOL) - 7
0429   DIST = 0.50 * (WIC (1) + WIC (IOL) + D (J1, J2)
0430   IF (ABS (XC (1) - XC (IOL)) .GT. 0.15) GO TO 340
0431   DIST = 0.50 * (FGL (1) + FGL (IOL) + D (J1, J2)
0432   IF (ABS (YC (1) - YC (IOL)) .GT. 0.15) GO TO 340
0433   CALL PILEX (IGB, 1, AC, NG, 1, XC (IOL), YC (IOL))
0434 CONTINUE
0435 CALL EXEC (IGB)
0436 CONTINUE
      CHOOSE BETWEEN RETURN TO C.P. OR CONTINUE MOVING COMPONENT
0437 CALL INCL (IGTX, 40)
0438 CALL INCL (IGTX, 41)
0439 CALL RQAIN (LEVI, LOC, 2, LPEN, 34)
0440 CALL OMIT (IGTX, 40)
0441 CALL OMIT (IGTX, 41)
0442 CALL COMPO (IGB)
0443 IF (LPEN (41 .EQ. 41) GO TO 318
      LPEN(41) = 41 = CONTINUE MOVING THE COMPONENT
0444 CALL MENU (11)
0445 CALL RESET (IGD)
0446 CALL RESTOR (IGD)
0447 IF (INCIRC .GT. 10) CALL CCMPRS
0448 GO TO 1
      - X - X - X - X - X -
      PUT ON LABELS AND LINES
0400 CONTINUE
0401 DO 405 IOL = 50, 54
      CALL INCL (IGTX, IOL)
0402 CONTINUE
0403 CALL INCL (IGTX, 60)
0404 CALL RQAIN (LEVI, LOC, 2, LPEN, 34)
0405 DO 410 IOL = 50, 54
      CALL OMIT (IGTX, IOL)
0406 CONTINUE
0407 CALL OMIT (IGTX, 60)
0408 K = LPEN (41 - 49)
0409 IF (K .EQ. 11) GO TO 452
0410 GO TO (415, 420, 430, 455, 1), K
0411 GO TO 400
      WRITING
0412 CONTINUE
0413 LCTR = LCTR + 1
0414 CALL PILEX (IGTX, 1, 1, NG, 1, 60, 40)
0415 CALL EXEC (IGTX)
0416 CALL LOCUS (IGTX, 1)
0417 CALL RQAIN (LEVI, LOC, 2, NG, 32)
0418 GO TO 400
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0401 00005240
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0460 CALL GSPRD (IGTY, TXL (LETR), 1, 1)
0470 CALL RCURS (IGTY)
0471 CALL XHALF
0472 CALL RSLT (IGTY)
0473 XL (LETR) = XH
0474 YC (LETR) = YH
0475 CALL PLEXI (IGD, TXL (LETR), 1, NC, NO, 1, XH, YH)
0476 CALL EXEC (IGD)
0477 GO TO 400

C
C INCLUDE OR OMIT OUTCINCS
C 420 CONTINUE
C 421 CALC INCL (IGTX, 55)
C 422 CALL INCL (IGTX, 56)
C 423 CALL RQAIN (CLV, LUC, 2, CPEN, 34)
C 424 CALL OMIT (IGTX, 55)
C 425 CALL OMIT (IGTX, 56)
C 426 K = LPEN (4)
C 427 CALL IDENT (1)
C 428 IF (K.EQ. 55) MOVE (1) = .TRUE.
C 429 IF (K.EQ. 56) MOVE (1) = .FALSE.
C 430 CALL COMPO (IGD)
C 431 GO TO 400

C
C PRIORIZE OR ELIMINATE A CIRCLE
C CIRCLES ARE CURVALUED ON NCIRC + 100
C 432 CONTINUE
C 433 CALL INCL (IGTX, 55)
C 434 CALL INCL (IGTX, 56)
C 435 CALL RQAIN (CLV, LUC, 2, LPEN, 34)
C 436 CALL OMIT (IGTX, 55)
C 437 CALL OMIT (IGTX, 56)
C 438 IF (LPEN (4).EQ. 56) GO TO 432
C 439 IF (LPEN (4).EQ. 55) GO TO 425
C 440 GO TO 400

C ELIMINATE A CIRCLE
C 441 CONTINUE
C 442 IF (NCIRC.EQ. 0) GO TO 400
C 443 CALL RQAIN (CLV, LUC, 2, LPEN, 34)
C 444 NCIR = LPEN (4) - 100 = 0
C 445 CALL RSLT (IGD)
C 446 CALL PLEXI (IGD)
C 447 GO TO 400

C ADD A CIRCLE
C 448 CONTINUE
C 449 NCIRC = NCIRC + 1
C 450 SPECIFY RADIOS
C 451 CALL INCL (IGTX, 57)
C 452 CALL PLEXI (IGTY, '0.00', 4, 4, NC, 1, 55, 50)
C 453 CALL EXEC (IGTY)
C 454 CALL RCURS (IGTY, 4)
C 455 CALL RQAIN (CLV, LUC, 2, NO, 32)
C 456 CALL GSPRD (IGTY, PL, 4, 1)
C 457 CALL RCURS (IGTY)
C 458 CALL RSLT (IGTY)
C 459 CALL OMIT (IGTX, 57)
C 460 GO TO 400

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0517 CALL HCNV (FL (1), RAD (NCIRC), 202, 0)
0518 CALL INCL (IGTX, 58)
0519 CALL INCL (IGTX, 59)
0520 CALL KRAIN (LEVI, LUL, 2, LPEN, 34)
0521 CALL CM11 (IGTX, 59)
0522 CALL CM11 (IGTX, 59)
0523 IF (LLEN (4) .EQ. 58) GO TO 435
0524 IF (LLEN (4) .EQ. 59) GO TO 440
0525 GO TO 400

C ASSOCIATE CIRCLE WITH A COMPONENT
C 435 CONTINUE
CALL IDENT (1)
XCR (NCIRC) = XC (1)
YCR (NCIRC) = YC (1)
MCIR (NCIRC) = 1 + 100
GO TO 445

C INDEPENDENT CIRCLE
C 440 CONTINUE
CALL XHAIR
XCR (NCIRC) = XH
YCR (NCIRC) = YH
MCIR (NCIRC) = 1
C 445 CONTINUE
CALL FOUND (NCIRC, IGD)
GO TO 400

C DRAW A LINE
C 455 CONTINUE
LINE = LINE + 1
CALL XHAIR
XS (LINE) = XH
YS (LINE) = YH
CALL XHAIR
XF (LINE) = XH
YF (LINE) = YH
CALL PSMT (IGD, XS (LINE), YS (LINE), XF (LINE), YF (LINE))
CALL EXEC (IGD)
GO TO 400

C ENTER PANEL NAME
C 452 CONTINUE
CALL INCL (IGTX, 54)
C 460 CONTINUE
IF (NAME .GE. 20) GO TO 400
NAME = NAME + 1
CALL PTEXT (IGTY, '-', 1, 1, NU, 1, 65, 38)
CALL TOURS (IGTY, 1)
CALL KRAIN (LEVI, LUL, 2, NU, 32, 34)
CALL ROPS (IGTY)
IF (LLEN (4) .EQ. 34) GO TO 454
CALL GSPD (IGTY, PNH (NAME), 1, 1)
CALL XHAIR
CALL RSLT (IGTY)
XPNM (NAME) = XH
YPNM (NAME) = YH
CALL PTEXT (IGD, PNM (NAME), 1, NC, NU, 1, XH, YH)
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HAIN

FORTRAN IV G (FUEL 21

```

0568 CALL LALC (IGD)
0569 GO TO 460
0570 CONTINUE
0571 NAME = NAME - 1
0572 CALL RESET (IGTY)
0573 GO TO 400

C
C X - X - X - X - X - X
C
C PRODUCT HARD - COPY OUTPUT
C
500 CONTINUE
IF (ICA) CALL GMIT (IGA)
IF (INCP .GT. 0) CALL GMIT (IGB)
CALL RESET (IGD)
CALL CUMPO (IGC)
CALL PSGMT (IGC, X (1), Y (1), X (4), Y (1))
CALL PSGMT (IGC, X (1), Y (2), X (4), Y (2))
CALL PSGMT (IGC, X (1), Y (3), X (4), Y (3))
CALL PSGMT (IGC, X (2), Y (1), X (2), Y (2))
CALL PSGMT (IGC, X (3), Y (1), X (3), Y (2))
CALL PSGMT (IGC, X (4), Y (1), X (4), Y (2))
CALL RESETOR (IGC)
CALL EXEC (IGC)
CALL GMIT (IGTX, 59)
CALL MLTIS (LEVEL, 4, 1)
CALL RGAIN (LEVI, LUC, 2, NO, 1)
CALL MLTIS (LOVE, 2)

C
C THE FOLLOWING STATEMENT CAUSES THE HARD-COPY
C OUTPUT TO BE PRODUCED ON THE GOULD:
C CALL GSPGLD (JELVE)
C CALL RESET (IGC)
IF (ICA) CALL INCL (IGA)
IF (INCP .GT. 0) CALL INCL (IGB)
CALL INCL (IGTX, 54)
CALL RESETOR (IGC)
GO TO 1

C
C X - X - X - X - X - X
C
C RECORD : PRINTED AND PUNCHED OUTPUT
C
600 CONTINUE
WRITE (6, 1030)
PANL (OUTLINE DESCRIP) JUN
WRITE (6, 1024) (PMH (K), K = 1, 20), ISP
WRITE (6, 1001)
IF (ICA) GO TO 601
GO TO 602
601 CONTINUE
WRITE (6, 1003) HGTP, X1, XC
WRITE (7, 1026) (SP, (PMH (K), K = 1, 2)), X1, HGTP
WRITE (6, 1027) (PMH (K), K = 1, NAME)
WRITE (6, 1029) (APMH (K), K = 1, NAME)
WRITE (6, 1029) (YPMH (K), K = 1, NAME)
GO TO 603
602 CONTINUE
603 CONTINUE
604 CONTINUE
605 CONTINUE
606 CONTINUE
607 CONTINUE
608 CONTINUE
609 CONTINUE
610 CONTINUE

```

00007550	WRITE (6, 10001	
00007560	CONTINUE	
00007570	WRITE (6, 10021	
00007580		
00007590	MCURRING HILLS	
00007600	IF (NCIRC .EQ. 0) GO TO 610	
00007610	WRITE (6, 10061 MOUNT	
00007620	IF (MOUNT .EQ. 0) GO TO 610	
00007630	K = 1	
00007640	DO 605 IDL = 1, NCIRC	
00007650	IA (IDL) = 0	
00007660	IF (MCUR (IDL) .NE. 21 GO TO 605	
00007670	XA (K) = XCR (IDL)	
00007680	YA (K) = YCR (IDL)	
00007690	K = K + 1	
00007700	CONTINUE	
00007710	WRITE (6, 10051 (XA (K), K = 1, MOUNT1	
00007720	WRITE (6, 10061 (YA (K), K = 1, MOUNT1	
00007730	CONTINUE	
00007740		
00007750	COMPONENT LISTING	
00007760	IF (NCMP .EQ. 0) GO TO 615	
00007770	WRITE (6, 10021	
00007780	WRITE (6, 10071	
00007790	WRITE (6, 10011	
00007800	WRITE (6, 10081	
00007810	WRITE (6, 10011	
00007820	DO 615 IDL = 1, NCMP	
00007830	IDF = 5 * IDL	
00007840	LS = IDL - 4	
00007850	WRITE (6, 10091 IDL, (TNM (K), K = 105, IDF),	
00007860	1 11YP (IDL), MID (IDL), HGT (IDL), XC (IDL), YC (IDL)	
00007870	WRITE (7, 10251 IDL, (INM(K), K = 105, IDF), 11YP (IDL),	
00007880	1 11IB (IDL), HGT (IDL), XC (IDL), YC (IDL), ISP	
00007890	CONTINUE	
00007900	WRITE (6, 10021	
00007910		
00007920	OTHER CIRCLES	
00007930	K = 0	
00007940	IF (NCIRC .EQ. 0) GO TO 620	
00007950	DO 620 ILL = 1, NCIRC	
00007960	IF (CIR (ILL) .EQ. 1 .OR. MCIR (ILL) .GT. 100) K = K + 1	
00007970	CONTINUE	
00007980	WRITE (6, 10101 K	
00007990	IF (K .EQ. 0) GO TO 640	
00008000	WRITE (6, 10011	
00008010	K = 0	
00008020	DO 625 IDL = 1, NCIRC	
00008030	IF (MCUR (IDL) .EQ. 0 .OR. MCUR (IDL) .EQ. 21 GO TO 625	
00008040	K = K + 1	
00008050	IA (K) = 0	
00008060	IF (MCUR (IDL) .GT. 100) IA (K) = MCUR (IDL) - 100	
00008070	XA (K) = XCR (IDL)	
00008080	YA (K) = YCR (IDL)	
00008090	KA (K) = RAD (IDL)	
00008100	CONTINUE	
00008110	KI = 1	
00008120	KL = 12	


```

0001 SUBROUTINE XHAIR                                00011880
C                                                     00011890
C FOR INDICATING THE LOCATION (POINT) ON THE SCREEN 00011900
C                                                     00011910
C DIMENSION PL (4)                                00011920
C COMMON /B/ NU (1), LEVL, LOC, IDEVE, XH, YH      00011930
C CHARACTER /C/ IGB, IGIX, IGIY, JGD              00011940
C IWT = 2                                           00011950
C J = 1                                              00011960
C                                                     00011970
C CALL MLTIS (IOLVL, 4, 0, 3, 4, 6, 8, 9, 11, 14, 15) 00011980
C CALL INCL IIGIX, 431                             00011990
C CALL INCL IIGIX, 44)                             00012000
C STEP = 0.01                                       00012010
C GO TO 9                                           00012020
C CONTINUE                                         00012030
C CALL RESPT (IGB, IOL)                             00012040
C CALL RESPT IIGIYI                                 00012050
C IF IWT .EQ. 1) GO TO 2                           00012060
C DISPLAY X AND Y COORDINATES                     00012070
C CONTINUE                                         00012080
C CALL BCNV (XH, PL (1), I02, 8, 3)                 00012090
C CALL BCNV IYH, PL (3), I02, 8, 3)                 00012100
C CALL PTEXT IIGIY, PL (1), 8, NU, NU, 1, 35, 50)   00012110
C CALL PTEXT IIGIY, PL (3), 8, NU, NU, 1, 55, 50)   00012120
C DISPLAY STEP SIZE                               00012130
C                                                     00012140
C CALL BCNV (STEP, PL (1), I02, 8, 4)                00012150
C CALL PTEXT IIGIY, PL (1), 8, NU, NU, 1, 15, 50)   00012160
C CALL EXEC IIGIY)                                00012170
C CONTINUE                                         00012180
C CALL PTEXT IIGB, '+', 1, I00, NU, 1, XH, YH)      00012190
C CALL EXEC (IGB)                                  00012200
C CALL WAITG (03)                                   00012210
C CALL KCAIN ILEVL, LOC, IWT, NU, 0, -151          00012220
C IF IIGC .EQ. -11 GO TO 11                         00012230
C IF IIGC .EQ. 01 GO TO 3                             00012240
C RUN RIGHT * DOWN /                               00012250
C GO TO 11, 14, 12, 5, 13, 1, 5, 7, 14, 1, 1, 6, 8), LOC 00012260
C LEFT STEP EXIT                                  00012270
C CONTINUE                                         00012280
C GO TO 11), 12, 13, 14), J                        00012290
C YH = YH + STEP                                    00012300
C J = 1                                              00012310
C GO TO 1                                           00012320
C XH = XH - STEP                                    00012330
C J = 2                                              00012340
C GO TO 1                                           00012350
C XH = XH + STEP                                    00012360
C J = 3                                              00012370
C GO TO 1                                           00012380
C YH = YH - STEP                                    00012390
C J = 4                                              00012400
C GO TO 1                                           00012410
C CONTINUE                                         00012420
C IWT = 1                                           00012430
C GO TO 1                                           00012440
C CONTINUE                                         00012450
C IWT = 2

```

```

0051      GO TO 1
0052      STEP = STEP * 10.000
0053      GO TO 1
0054      STEP = STEP / 10.000
0055      GO TO 1
0056      CONTINUE
0057      CALL MLTTS (IDEVL, 21
0058      CALL RESET (IGB, 100)
0059      CALL RESET (IGIV1
0060      CALL GMIT (IGIX, 431
0061      CALL GMIT (IGIX, 441
0062      RETURN
0063      END
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RCUNC

FORTRAN IV C LEVEL 21

```

0001      SUBROUTINE ROUNO 11, 1G)
0002      C
0003      C      PRODUCES A CIRCLE WITH A GIVEN RADIUS AND CENTER
0004      C      ) = NUMBER OF THE CIRCLE      1G = GRAPHIC DATA SLT
0005      C      ONLY ONE CIRCLE IS PRODUCED
0006      C
0007      DIMENSION X (40), Y (40), NO (11)
0008      COMMON /O/ RAD(100), XCR(100), YCR(100), MC(R (100)
0009      IF (MC(R (11) .EQ.0) RETURN
0010      NO (1) = -5
0011      AN = 0.0000
0012      IGV = 1 + 100
0013      N = 10
0014      IF (RAD (11) .GT. 0.25) N = RAD (11) * 40
0015      IF (N .GT. 40) N = 40
0016      A = 6.2832 / N
0017      DO 110 I = 1, N
0018      X (101) = RAD (11) * COS (AN) + XCR (11)
0019      Y (101) = RAD (11) * SIN (AN) + YCR (11)
0020      AN = AN + A
0021      CONTINUE
0022      CALL SIFUS (1G, X IN), Y IN))
0023      CALL PLINF 11G, X, Y, IGV,NO, 1, N)
0024      CALL EXLC 11G)
0025      RETURN
0026      END

```

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CUMPRS

FORTRAN IV G LEVEL 21

```

0001      SUBROUTINE CUMPRS
0002      C
0003      C      ELIMINATES EMPTY SPACES IN CIRCLE ARRAYS
0004      C      CAUSED BY OMITTED OR MOVED CIRCLES
0005      C
0006      COMMON /D/ RAD(1001, XCR(1001, YCR(1001, MCIR(1001, J
0007      I = 0
0008      1 CONTINUE
0009      IF 11.EQ. J1 GO TO 3
0010      I = 1 + 1
0011      IF (MCIR(11).NE. 01 GO TO 1
0012      K = J - 1
0013      DO 2 IOL = 1, K
0014      XCR(IOL) = XCR(IOL+1)
0015      YCR(IOL) = YCR(IOL+1)
0016      RAD(IOL) = RAD(IOL+1)
0017      MCIR(IOL) = MCIR(IOL+1)
0018      2 CONTINUE
0019      J = J - 1
0020      GO TO 1
0021      3 CONTINUE
0022      RETURN
0023      END

```

```

SUBROUTINE MENU (I)
C
C      PRODUCTS SHAPES ACCORDING TO COMPONENT TYPE
C
COMMON /A/  NCMP, XC(150), YC(50), WID(50), HGT(50), MUVL(50)
COMMON /C/  IGB, IGIX, IGTY, IGD
COMMON /D/  RAD(100), XCR(100), YCR(100), MCIR(100), NCIRC
COMMON /F/  ITYP(50), LETR, LINE, MLIN(150)
COMMON /H/  XL(50), XL(50), YL(50), XS(50), YS(50), XF(50), YF(50)
J = ITYP(I)
LOGICAL MOVE
IF (NCIRC.EQ.0) GO TO 20
DO 20 IDL = 1, NCIRC
    IF (MCIR(IDL).EQ.1 + 100)) MCIR(IDL) = 0
CONTINUE
IF (LINE.EQ.0) GO TO 30
DO 30 IDL = 1, LINE
    IF (MLIN(IDL).EQ.(1 + 100)) MLIN(IDL) = 0
CONTINUE
GO TO IL, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, J
RETURN
C
C      J = 1 = CIRCULAR SCALE
C      CIRCLE WITH POINTER FROM CENTER
C
CONTINUE
CALL ADCIR(1)
CALL ADCIR(1)
RAD(NCIRC) = 0.05
LINE = LINE + 1
K = LINE
XS(K) = XC(1)
YS(K) = YC(1)
XF(K) = XC(1)
YF(K) = YC(1) + 0.40 * HGT(1)
MLIN(K) = 1 + 100
RETURN
C
C      J = 2 = SEMICIRCULAR SCALE
C      CIRCLE WITH POINTER FROM LOWER PART
C
CONTINUE
CALL ADCIR(1)
NCIRC = NCIRC + 1
K = NCIRC
RAD(K) = 0.05
XCR(K) = XC(1)
YCR(K) = YC(1) - 0.35 * HGT(1)
MCIR(K) = 1 + 100
LINE = LINE + 1
K = LINE
XS(K) = XC(1)
XF(K) = XC(1)
YS(K) = YC(1) - 0.35 * HGT(1)
YF(K) = YC(1) + 0.20 * HGT(1)
MLIN(K) = 1 + 100
RETURN
C
C      J = 3 = LINEAR SCALE
C      USES RECTANGULAR OUTLINE WITH POINTER IN CENTER
C

```

```

0067 3 CONTINUE
0068 LINE = LINE + 1
0069 K = LINE
0070 MLIN (K) = 1 + 100
0071 IF (FGL (1) .GT. WID (1)) GO TO 103
0072 XS (K) = XC (1)
0073 XF (K) = XC (1)
0074 YS (K) = YC (1) - 0.50 * HGT (1)
0075 YF (K) = YC (1) + 0.20 * HGT (1)
0076 RETURN
0077 103 CONTINUE
0078 YS (K) = YC (1)
0079 YF (K) = YC (1)
0080 XS (K) = XC (1) - 0.20 * WID (1)
0081 XF (K) = XC (1) + 0.50 * WID (1)
0082 RETURN
0083 C J = 5 = INDICATOR / WARNING LIGHTS
0084 C
0085 5 CONTINUE
0086 CALL ADCIR (1)
0087 RETURN
0088 C
0089 C J = 10 = ROTARY SELECTOR
0090 C CIRCLE WITH FIVE-SIDED SHAPL
0091 10 CONTINUE
0092 LINE = LINE + 1
0093 XS (LINE) = XC (1)
0094 YS (LINE) = YC (1) + 0.5 * HGT (1)
0095 XF (LINE) = XC (1) + 0.15 * HGT (1)
0096 YF (LINE) = YC (1) + 0.35 * HGT (1)
0097 MLIN (LINE) = 1 + 100
0098 LINE = LINE + 1
0099 XS (LINE) = XC (1) + 0.15 * HGT (1)
0100 YS (LINE) = YC (1) + 0.35 * HGT (1)
0101 XF (LINE) = XC (1) + 0.15 * HGT (1)
0102 YF (LINE) = YC (1) - 0.45 * HGT (1)
0103 MLIN (LINE) = 1 + 100
0104 LINE = LINE + 1
0105 XS (LINE) = XC (1) + 0.15 * HGT (1)
0106 YS (LINE) = YC (1) - 0.45 * HGT (1)
0107 XF (LINE) = XC (1) - 0.15 * HGT (1)
0108 YF (LINE) = YC (1) - 0.45 * HGT (1)
0109 MLIN (LINE) = 1 + 100
0110 LINE = LINE + 1
0111 XS (LINE) = XC (1) - 0.15 * HGT (1)
0112 YS (LINE) = YC (1) - 0.45 * HGT (1)
0113 XF (LINE) = XC (1) - 0.15 * HGT (1)
0114 YF (LINE) = YC (1) + 0.35 * HGT (1)
0115 MLIN (LINE) = 1 + 100
0116 LINE = LINE + 1
0117 XS (LINE) = XC (1) - 0.15 * HGT (1)
0118 YS (LINE) = YC (1) + 0.35 * HGT (1)
0119 XF (LINE) = XC (1)
0120 YF (LINE) = YC (1)
0121 MLIN (LINE) = 1 + 100
0122 109 CALL ADCIR (1)
0123 RETURN
0124 C
0125 00009350
0126 00009860
0127 00009870
0128 00009880
0129 00009890
0130 00009900
0131 00009910
0132 00009920
0133 00009930
0134 00009940
0135 00009950
0136 00009960
0137 00009970
0138 00009980
0139 00009990
0140 00010000
0141 00010010
0142 00010020
0143 00010030
0144 00010040
0145 00010050
0146 00010060
0147 00010070
0148 00010080
0149 00010090
0150 00010100
0151 00010110
0152 00010120
0153 00010130
0154 00010140
0155 00010150
0156 00010160
0157 00010170
0158 00010180
0159 00010190
0160 00010200
0161 00010210
0162 00010220
0163 00010230
0164 00010240
0165 00010250
0166 00010260
0167 00010270
0168 00010280
0169 00010290
0170 00010300
0171 00010310
0172 00010320
0173 00010330
0174 00010340
0175 00010350
0176 00010360
0177 00010370
0178 00010380
0179 00010390
0180 00010400
0181 00010410
0182 00010420

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CAMP

FORTRAN IV 9 LEVEL 21

```

0001      SUBROUTINE COMPO (IG)
0002      C
0003      C      PROJECTS COMPONENT CENTER DOTS AND RECTANGULAR OUTLINES
0004      C      PRODUCED FOR ALL COMPONENTS
0005      C
0006      L
0007      DIMENSION XE (4), YL (4)
0008      COMMON /A/ NCMP, XL (50), YL (50), WID (50), HGT (50), MUVE (50)
0009      LOGICAL MOVE
0010      LUMEN /B/ NO (1), LEVL, LCC, IDEVL, XH, YH
0011      IF (NCMP .EQ. 0) RETURN
0012      CALL RSLT (IG)
0013      DO 1 IDL = 1, NCMP
0014          CALL PPNT (IG, XL (IDL), YL (IDL), IDL)
0015          IF (MOVE (IDL) .EQ. 1)
0016              XI (1) = XL (IDL) - 0.5 * WID (IDL)
0017              XE (2) = XL (IDL) + 0.5 * WID (IDL)
0018              XL (3) = XE (2)
0019              XF (4) = XE (1)
0020              YL (1) = YL (IDL) + 0.5 * HGT (IDL)
0021              YF (2) = YE (1)
0022              YL (3) = YL (IDL) - 0.5 * HGT (IDL)
0023              YF (4) = YE (3)
0024          CALL STPLS (IG, XE (4), YL (4))
0025          CALL PLINE (IG, XE, YL, NG, 1, 4)
0026          CONTINUE
0027      CALL EXEC (IG)
0028      RETURN
0029      END
0030
0031      00011230
0032      00011240
0033      00011250
0034      00011260
0035      00011270
0036      00011280
0037      00011290
0038      00011300
0039      00011310
0040      00011320
0041      00011330
0042      00011340
0043      00011350
0044      00011360
0045      00011370
0046      00011380
0047      00011390
0048      00011400
0049      00011410
0050      00011420
0051      00011430
0052      00011440
0053      00011450
0054      00011460
0055      00011470
0056      00011480
0057      00011490
0058      00011500

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RESTER

PROGRAM IV 6 LEVEL 21

```

0001 SUBROUTINE RESTOR (IG)                                00012820
C                                                                    00012830
C PNODES OR RESTORES LETTERS, LINES, CIRCLES, NAME 00012840
C                                                                    00012850
CUMLEN /0/ RAD(1001, XCR(1001, YCR(1001, MLIR (1001, NLCIRC 00012860
COMMON /E/ ITP (50), LETR, LINE, MLIN (50) 00012870
COMMON /F/ TXL(501, XL(501, YL(501, XS(501, YS(501, XF(501, YF(501 00012880
COMMON /G/ PNM (201, YPNM (201, YPNM (201, NAME 00012890
IF (LETR .EQ. 0) GO TO 2 00012900
DO 1 IDL = 1, LCTR 00012910
CALL PTEXT (IG, TXL(IDL, 1, NG, NU, 1, XL(IDL), YL(IDL)) 00012920
1 CONTINUE 00012930
2 CONTINUE 00012940
IF (LINE .EQ. 0) GO TO 4 00012950
DO 3 IDL = 1, LINE 00012960
IF (MLIN (IDL) .EQ. 0) GO TO 3 00012970
CALL PPGMT (IG, XS(IDL), YS(IDL), XF(IDL), YF(IDL)) 00012980
3 CONTINUE 00012990
4 CONTINUE 00013000
IF (LCIRC .EQ. 0) GO TO 6 00013010
DO 5 IDL = 1, NLCIRC 00013020
CALL ROUNO (IDL, IGI 00013030
5 CONTINUE 00013040
6 CONTINUE 00013050
IF (NAME .EQ. 0) GO TO 8 00013060
DO 7 IDL = 1, NAME 00013070
CALL PTEXT (IG, PNM (IDL), 1, NG, NU, 1, XPNM (IDL), YPNM (IDL)) 00013080
7 CONTINUE 00013090
8 CONTINUE 00013100
CALL EXEC (IG) 00013110
RETURN 00013120
END 00013130

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ADCTR

Z1

FORTRAN IV G LEVEL 21

```

0001      SUBROUTINE ADCTR (I)
C
C      ACDS A CIRCLE
C
      COMMON /A/ N, XC (50), YC (50), WID (50)
      COMMON /D/ RAD (100), XCR (100), YCR (100), MCTR (100), K
      K = K + 1
      RAD (K) = 0.50 * WID (1)
      XCR (K) = XC (1)
      YCR (K) = YC (1)
      MCTR (K) = 1 + 100
      RETURN
      END
0002
0003
0004
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0021
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0001 SUBROUTINE IDENT (I)
C IDENTIFY COMPONENT BY EITHER LIGHTPLANNING ITS DUT
C UP BY TYPING IN ITS NUMBER
C
0002 DIMENSION LPEN (IC)
0003 COMMON /B/ NO (I), LEVL, LCC, LDEVE, XH, YH
0004 COMMON /C/ IGB, IGTX, IGTY, IGD
0005 DATA IX /'0000'/
C SELECT - LP DUT OR TYPE COMPONENT NUMBER
C 1
C CONTINUE
C CALL INCL (IGTX, 45)
C CALL INCL (IGTX, 46)
C CALL KQATN (LEVL, LCC, 2, LPEN, 34)
C CALL CMIT (IGTX, 45)
C CALL CMIT (IGTX, 46)
C IF ILPEN (4) .EQ. 45) GO TO 2
C IF ILPEN (4) .EQ. 46) GO TO 3
C GO TO 1
C 2 LIGHTPEN COMPONENT DUT
C CALL KQATN (LEVL, LCC, 2, LPEN, 34)
C 1 = LPEN (4)
C RETURN
C 3 TYPE IN COMPONENT NUMBER
C CONTINUE
C CALL INCL (IGTX, 42)
C CALL PTLXT (IGTY, IX, 4, 5, NO, 1, 60, 50)
C CALL EXEC (IGTY)
C CALL ICURS (IGTY, 5)
C CALL KQATN (LEVL, LCC, 2, NO, 32)
C CALL GSPRD (IGTY, PL, 4, 1)
C CALL ACURS (IGTY)
C CALL PSET (IGTY)
C CALL CMIT (IGTX, 42)
C CALL GCONV IFL, 1, 203, 4)
C RETURN
C END
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